Center Innovation Fund: GSFC CIF

Broad Bandwidth Meta-Material Antireflection Coatings for Measurement of the Cosmic Microwave Background

Completed Technology Project (2013 - 2015)

Project Introduction

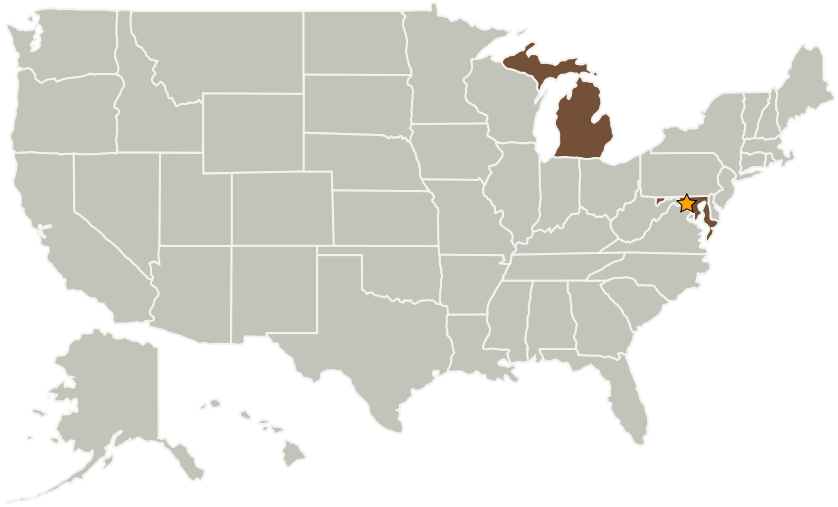
We propose to develop broad-band metamaterial antireflection (AR) coatings for the far-infrared and millimeter wave bands. The proposed coating technology could realize an unprecedented combination of low reflectance, negligible dielectric loss, and broad bandwidth for large diameter cryogenic refractive optics. The projected performance of the proposed technology matches the desired attributes for optical coatings intended for astrophysical instrumentation.

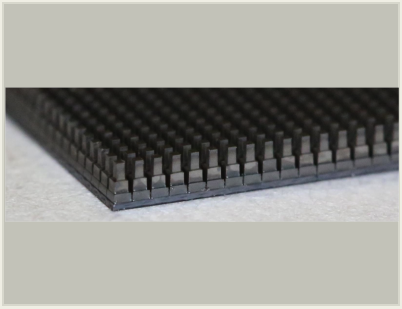
The effort's objective is to realize broadband low-reflectance coatings. The two key technical challenges are the design of the precision engineered materials and their characterization.

Anticipated Benefits

Broadband meta-material coatings are applicable in the millimeter and sub-millimeter for astrophysical instrumentation (e.g., CMBpol, SOFIA, SPIDER) and remote sensing. This technology also enables compact THz imagers for concealed threat detection and spectrometers for explosives detection.

Primary U.S. Work Locations and Key Partners





Mechanical test part for a wide-band three-layer AR coating.

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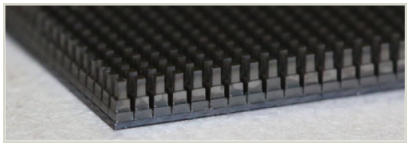
Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
University of Michigan-Ann Arbor	Supporting Organization	Academia	Ann Arbor, Michigan

Co-Funding Partners	Type	Location
University of Michigan-Ann Arbor	Academia	Ann Arbor, Michigan

Primary U.S. Work Locations	
Maryland	Michigan

Images



Metamaterial AR Coating
Mechanical test part for a wide-band three-layer AR coating.
(https://techport.nasa.gov/image/3053)

Project Website:

http://sciences.gsfc.nasa.gov/sed/

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Center / Facility:
Goddard Space Flight Center (GSFC)

Responsible Program:
Center Innovation Fund: GSFC CIF

Project Management

Program Director:
Michael R Lapointe

Program Manager:
Peter M Hughes

Project Manager:
Julie A Crooke

Principal Investigator:
Edward J Wollack

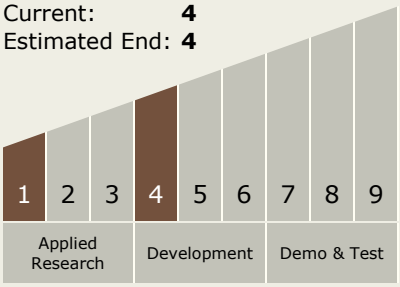
Co-Investigators:
David T Chuss
Jeff Mcmahon

Broad Bandwidth Meta-Material Antireflection Coatings for Measurement of the Cosmic Microwave Background

Completed Technology Project (2013 - 2015)

Technology Maturity (TRL)

Start: **1**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes